We claim:

1.   An apparatus for pallet inspection and repair comprising:

       an inspection station having a laser and a camera that collects light from the laser

       reflected from a pallet comprising a number of elements, the inspection station

5   connected to a computer,

       analysis software running on the computer that analyses the light reflected off the

       pallet and creates a repair recipe for the pallet, and

       an automated repair station that repairs the pallet according to the recipe.

2.   The apparatus of claim 1, wherein:

10   the inspection station moves the pallet relative to the laser using a robotic arm

       that grips the pallet in subsequent repair steps.

3.   The apparatus of claim 1, wherein:

       the analysis software performs steps comprising:

       a) receiving from the camera a stream of three-dimensional points, each point

15   having an x-, a y-, and a z-coordinate,

       b) filtering the stream of points to obtain the top surface geometry and

       topography by discarding all points having a z-coordinate below a threshold.

       c) locating four corner points from the stream, the corner points having

       coordinates of (minimum x, minimum y), (minimum x, maximum y), (maximum

20   x, minimum y), and (maximum x, maximum),

       d) identifying the edges of each element, thereby identifying the type and number

       of each element type,

       e) determining a pallet design from the type and number of each element type,

f) loading a set of criteria from a data base, based on the pallet design,

g) comparing each element of the pallet to the set of criteria to construct a list of repairs,

h) creating a repair recipe from the list of repairs.

5   4.   The apparatus of claim 3, wherein:

the element type is selected from the list comprising any of: top board, leading board, intermediate board, bearer, stringer, block, and bottom board.

5.   The apparatus of claim 1, wherein:

the repair station comprises:

10   a robot arm for holding the pallet during a repair step,

a tools for performing a repair step, and

a controlling computer.

6.   The apparatus of claim 5, wherein:

the controlling computer further comprises:

15   a robot controller,

a programmable logic controller, and

a repair recipe generation sub-system, such that:

the robot controller comprises a master job that is in communication with the programmable logic controller, and

20   a series of sub-jobs activated by the master job, which performs a recipe step using the tool.

7. The apparatus of claim 6 wherein:

the master job performs the steps of:

determining the position of the pallet in the robot arm,

moving the pallet to a new position by activating the robot arm,

5 initialising a first sub-job to perform a first repair step,

initialising subsequent sub-jobs to perform subsequent repair steps, and

terminating when all sub-jobs in the series of sub-jobs have been

performed.

8. A method for automated inspection and repair of a pallet, the method comprising

10 the steps of:

a) moving the pallet relative to an inspection station having a laser and a camera

connected to a computer,

b) collecting three-dimensional coordinate data, the data having an x-, a y-, and a

z-coordinate, from the reflected laser light using the camera and sending the data

15 to the connected computer,

c) analysing the coordinate data and determining a pallet design,

d) retrieving a set of criteria from a database based on the pallet design,

e) identifying an element of the pallet by examining the coordinate data,

d) comparing the element to the criteria,

20 e) if the element fails the criteria, creating a repair step,

f) collecting all repair steps into a recipe,

g) passing the recipe to an automated repair station, and

h) executing the recipe.

9.   The method of claim 8, wherein:

the step of analysing the coordinate data further comprises the steps of:

converting the three-dimensional data to a two-dimensional data by discarding

data having a z-coordinate exceeding a threshold,

5   creating a two-dimensional representation of the pallet,

locating the corners of the representation of the pallet,

identifying the elements of the pallet from the representation and classifying the

elements by kind,

counting the number of elements by kind,

10   determining the pallet design from the number and kind of the elements.

10.   The method of claim 8, wherein:

the step of creating a repair step further comprises the steps of:

identifying the element to be repaired,

selecting a type of repair,

15   selecting a tool to perform the repair step,

encoding the repair step into a computer-readable format.

11.   The method of claim 8, wherein:

the automated repair station comprises:

a robot controller that activates and positions a robot arm, the controller having a

20   master job and a series of sub-jobs,

a programmable logic controller in communication with the master job, and

a repair sub-system having a repair tool under the control of a sub-job.

12.   Software for the inspection and repair of a pallet, the software comprising

machine readable instructions and information on a machine readable format for

performing the steps of :

collecting three-dimensional data from a laser reflected from the pallet into a

5   camera, and converting the collected data into a two-dimensional representation

of the pallet,

locating and identifying the elements of the pallet by analysing the two-

dimensional representation,

determining a pallet design from the size, number, and location of the elements,

10   comparing the pallet against a criteria selected by pallet design from a database,

if the pallet fails the criteria, creating a repair recipe, and

executing the repair recipe at a repair station.

13.   The software of claim 12, wherein:

the step of converting the three-dimensional data into a two-dimensional

15   representation further comprises the steps of:

discarding data having a third dimension value exceeding a threshold

locating the corners of the pallet,

determining the size of the pallet,

normalising the representation relative to an origin.

20 14.   The software of claim 12, wherein:

the step of comparing the pallet against the criteria further comprises the steps of:

identifying a location and size for a board in the two-dimensional representation,

comparing the size and location of the board against the criteria, and

identifying the board, the board's location, the criteria, and the result of the comparison.

15.   The software of claim 14, wherein:

the step of creating a recipe further comprises the steps of:

selecting a board that failed a criteria,

choosing a repair step,

encoding the board, the board location, the criteria, and the repair step, into an encoded repair step, and

adding the encoded repair step to the recipe.

16.   The software of claim 12, wherein:

the step of executing the recipe further comprises the steps of:

loading the recipe into a programmable logic computer,

activating a robot controller to move and position a robot arm holding the pallet at the repair station,

selecting a tool,

controlling the tool to perform a repair step on the pallet.

17.   The software of claim 16, wherein:

the robot controller contains a master job and a series of sub-jobs, where the master job is in communication with the programmable logic controller.

18.   The software of claim 17, wherein:

the programmable logic controller selects a sub-job from the series of sub-jobs, directs the master job to execute the sub-job, where the sub-job:

determines a first location of the robot arm,

optionally, moves the robot arm to a second location,

selects the tool,

uses the tool to perform the repair step.

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